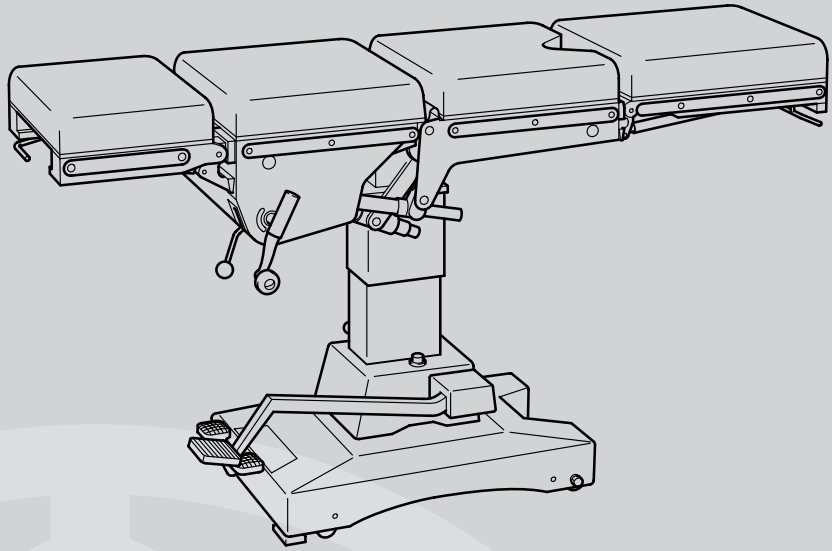
ESCHMANN

MR & MRS

OPERATION TABLE

Service manual



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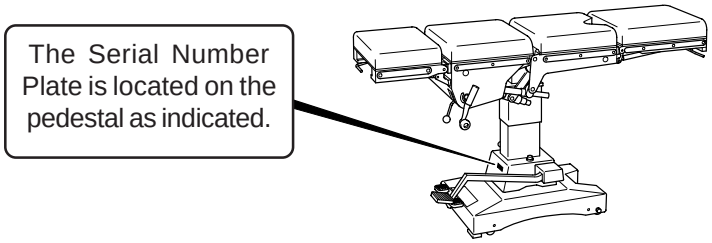
T-SM5f

Eschmann After Sales Service Department

The Eschmann After Sales Service Department is staffed and equipped to provide advice and assistance during normal office hours. To avoid delays when making enquires, please quote the Model and Serial Number of your Operation Table which is shown on the Serial Number plate, the location of which is shown below. Please ensure you include all alpha and numeric digits of the Serial Number.



For further information visit www.eschmann.co.uk

All correspondence relating to the after sales service of Eschmann Equipment to be addressed to :

UK Customers

Eschmann Equipment, Peter Road, Lancing, West Sussex, BN15 8TJ, England.
Tel: +44 (0) 1903 765040. Fax: +44 (0) 1903 762006.

Overseas Customers

Contact your local distributor. In case of doubt contact Eschmann Equipment.

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CE If the CE mark is affixed to the product, it indicates compliance with Council Directive 93/42/EEC of 14 June 1993 concerning medical devices.

READ THESE INSTRUCTIONS BEFORE USE
Keep these Instructions in a safe convenient place for future reference. Read in conjunction with the relevant Publications detailed in the preliminary information section.

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1. PRELIMINARY INFORMATION

1.1 These Instructions for Use should be referred to for details of the MR and MRS general purpose, four-section, mobile, operation tables, REF 80-085-15, 80-085-63 and 80-081-16 (serial numbers MRAB8E0000, MRRB8E0000, MSAB8E0000 respectively, or above) and fixed base MR tables 80-085-92 and 80-085-96. Information is also provided for earlier versions (within each section) if applicable.

1.2 This Manual covers both the MR and the MRS operation tables. The controls for the MRS tables are fitted on an adjustable, extended control arm. There are two versions of the control arm which are both described, however the later version only is now available. The MR table is also available in a reduced height version.

1.3 Instruction and Service Manuals should be readily accessible for reference prior to and when operating, cleaning and servicing the Operation Table. All manuals are available from Eschmann Equipment, see inside front cover for address details.

Related Technical Publications:-

Instruction for Use - MR and MRS Operation Tables - T-IM18
Illustrated Parts List - MR and MRS Operation Tables - T-IPL6

1.4 MR and MRS Operation Tables comply with BS6859 Part 1: 1987 (except for clause 7).

1.5 Fixed base tables should be serviced as conventional tables but check that the floor fixings are secure on a regular (three month) basis, also check the antistatic resistor for function and connection and replace the base seal if it becomes damaged..

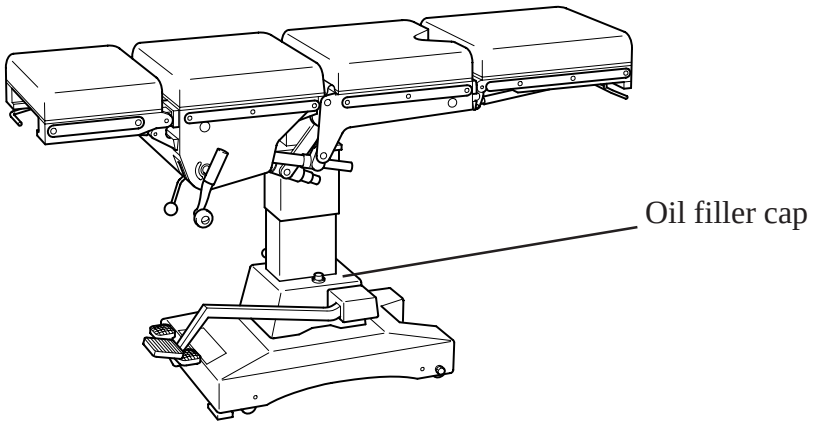


Fig. 1 MR Operation Table : General Arrangement

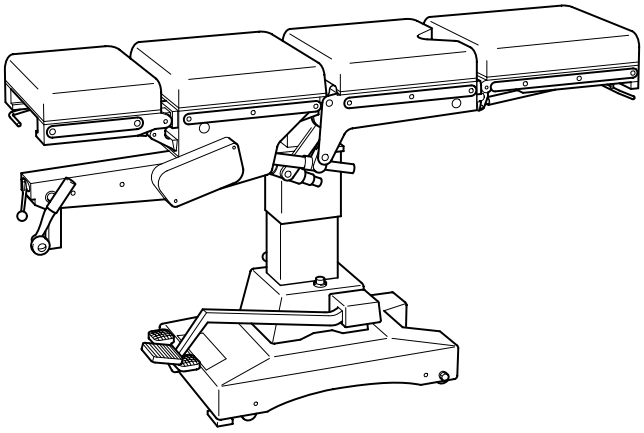
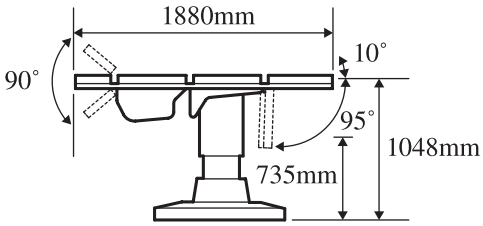
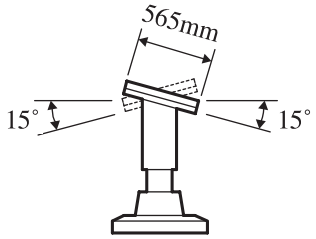


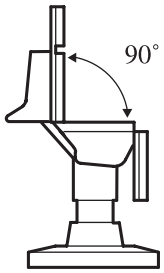
Fig. 2 MRS Operation Table : General Arrangement

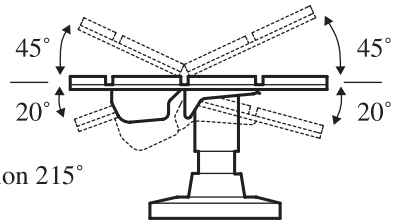
2. TECHNICAL DATA

DIMENSIONS AND MOVEMENTS

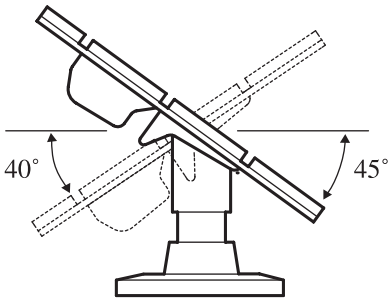








Maximum extension 215˚

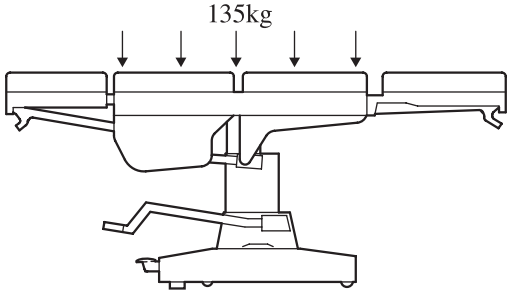


Side bar dimensions

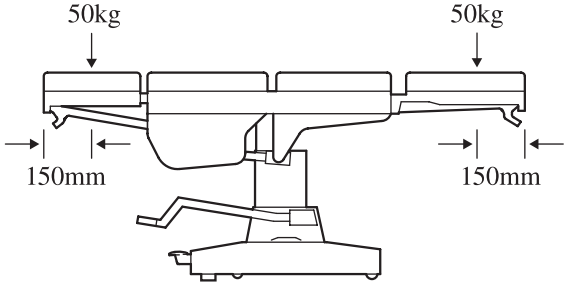
UK	31.75 x 6.35mm (1¼ x ¼ in)
North America	28.5 x 9.5mm (1⅛ x ⅜ in)
Europe	25 x 9mm

TABLE LOADING

Retention of Adjusted Height: The table will retain its adjusted height with a load of 135kg uniformly applied to the trunk sections.



Longitudinal Deflection Load: The table will withstand a load of 50kg applied at a point 150mm in from either end of the head or leg section.



NET WEIGHT (approx) 196kg

X-RAY ATTENUATION

The X-ray attenuation of the top of this operation table is equivalent to less than 0.5mm of 99.5% pure aluminium.

3. SAFETY NOTES

Attention to the following points will prolong the life and efficiency of your operating table and will help to avoid the risk of accidents, or damage:

DO:

- Keep the instruction manual close-to-hand.
- Read the instructions carefully before using the table.
- Check that the leg section is secure, and put the table base in the brake position before use.
- Raise the table top fully before washing the table, to expose all the ram covers surface.
- Read and follow the instructions for cleaning, and for the care of the mattresses and pads.
- Use the correct mattress and accessories.
- Service the table and accessories regularly.
- Remove table accessories and their clamps, in particular rotary clamps from side bars, when they are not in use.

DO NOT:

- Lift the table by its top.
- Push the table over rough surfaces, use a trolley.
- Drop the table (or individual sections) when transporting it.
- Put heavy weights on the table sections.
- Put sharp objects on, or against mattresses, pads, or the radiographic table top.
- Drop heavy objects onto the radiographic top.
- Spill oil, ether, or other chemical fluids onto the mattress or the pads.
- Pull the table by the head or leg section, always push it.
- Exceed maximum table loading

WARNINGS

The MR and MRS Operation Tables have been designed to minimise the possibility of accidental electrosurgery burns. Contact with any metal surfaces (e.g. table side bars, or other equipment etc.) can cause burns during electrosurgery and must be avoided.

The MR and MRS Operation Tables have been designed for patients weighing up to 135kg with their centre of gravity (normally the perineum) over the base. However patient positioning and additional loads can compromise table stability. Ensure that loading does not compromise table stability.

With the table in (or during transition into) the castor position, the centre of gravity of the patient (normally the perineum) should lie over the centre of the column . Whenever this is not practical the overhanging weight of the patient and table should be adequately supported (e.g. by at least two able people). Take extreme care when moving a table with a patient on and ensure that the table is at minimum height

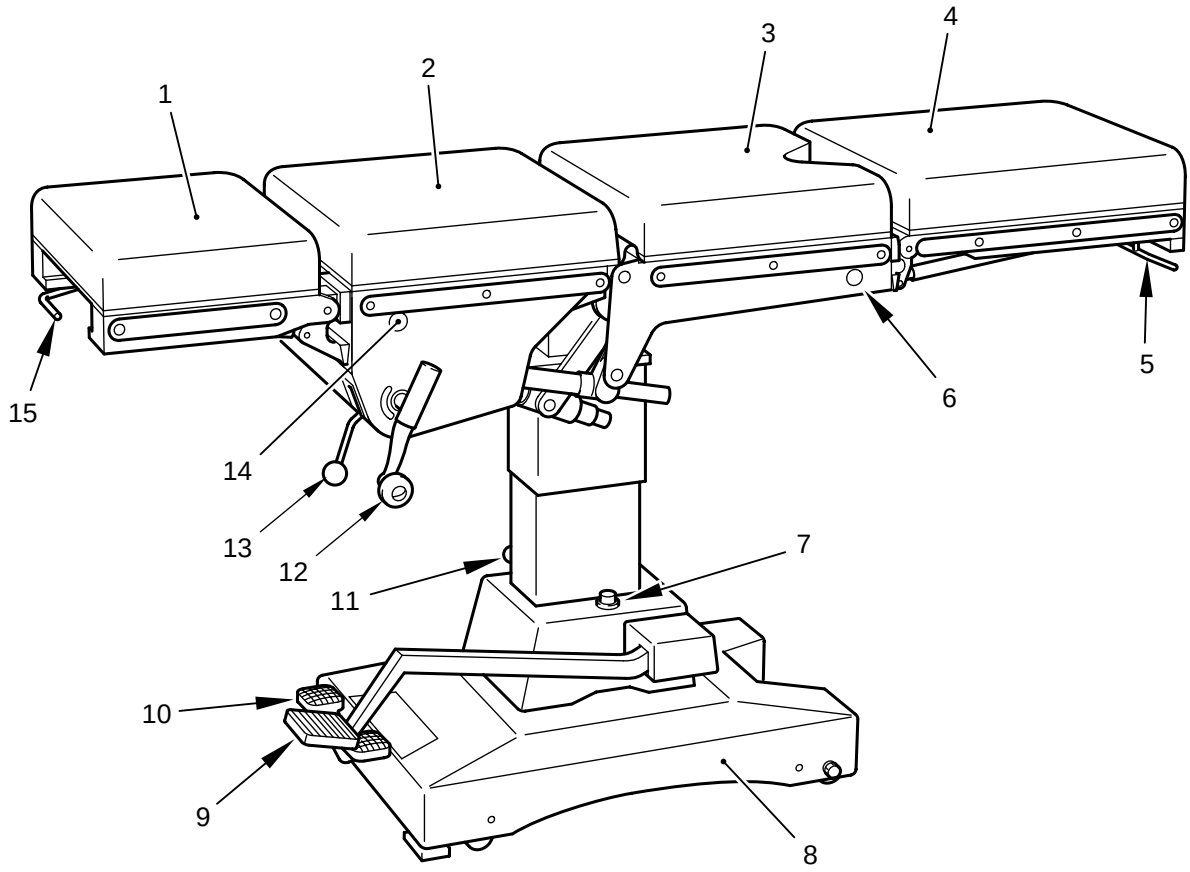
The patient's weight should be supported whenever the sections are adjusted or removed from the table during repositioning.

The head and leg sections are designed to support and position the appropriate part of the patient's weight only. Damage leading to failure of the section may be caused if excessive weight is applied. Also do not sit or lean on the control arm of the MRS table.

The maximum loading weight of 10kg must not be exceeded for the Detachable ophthalmic head flap and the Non-Detachable head flap accessories, as this may cause damage to the accessory and could result in injury to the patient.

It is necessary to check at regular intervals for wear, corrosion, material fatigue and ageing on all accessories which support all or part of the body of the patient using a single gas spring. Such accessories are the detachable ophthalmic head-flap and head-flap.

4. MAINTENANCE



1 Head Section
2 Upper Trunk Section
3 Lower Trunk Section
4 Leg Section
5 Quick-release Bar (Leg Section Angle)
6 Release Button, L.H. (Leg Section)
7 Oil Filler Cap
8 Base
9 Height Control Pedal
10 Base Control Pedal
11 Cylinder Locking Lever
12 Main Control Handle
13 Gear Lever
14 Release Button, R.H. (Head Section)
15 Quick Release Bar (Head Section Angle)

Fig. 3 MR Operation Table : Part identification and controls

4. MAINTENANCE

GENERAL

4.1 The information provided in this Service Manual falls into four categories:

- Cleaning, Disinfection, Care and Storage.
- Periodic lubrication, checks and adjustments
- Fault diagnosis and remedies
- Removal and installation of components

CLEANING, DISINFECTION, CARE AND STORAGE

4.2 For Cleaning, Disinfection, Care and Storage instructions refer to Section 8 of the Instructions for Use (Publication T-IM18, also see section 1.3).

PERIODIC LUBRICATION, CHECKS AND ADJUSTMENTS

Base Components

4.3 In order to carry out maintenance procedures to the table base, it is necessary to tilt the table on its side and expose the underside of the base. Proceed as follows:

i Remove the head and leg section in the normal manner (see Instruction for Use, Publication T-IM18).

ii Raise the table top to its maximum height.

iii Place an anaesthetist's stool, or similar strong support, alongside the table.

iv Place the brake pedal in the 'castor' position.

v Stand on the same side of the table as the support but with the pump lever on the opposite side. Push the table away about 30 cm and then pull it back. This ensures that all the castors are pointing away from the operator. Two people on the same side of the table as the support (one at each end) can now each place a foot against the base and lever the table over gently, lowering it onto the support.

Castors and wheels

4.4. Clean each castor (see Fig. 5) and wheel free of debris, then lubricate the castor and wheel ball races with a light machine oil (or WD40 aerosol lubricant).

Brakes and brake mechanism

4.5. Check the action of the brake mechanism (see Fig. 5) and also check for wear on the brake pads, broken brake pinion or quadrant teeth, play in the quadrant taper pins and adjustment between quadrant, roller and eccentric pin. Check stop screws for wear. To replace quadrant see section 4.44; to replace quadrant pinion, see section 4.45.

4.6 Fit new brake pads where necessary, referring to section 4.43.

Hydraulic Cylinder

4.7 Raise the table top to its maximum height, then depress the height adjustment (hydraulic pump) pedal fully and check for smoothness and rate of descent.

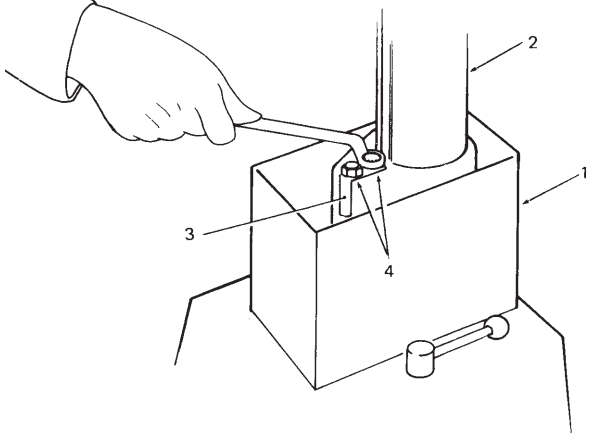


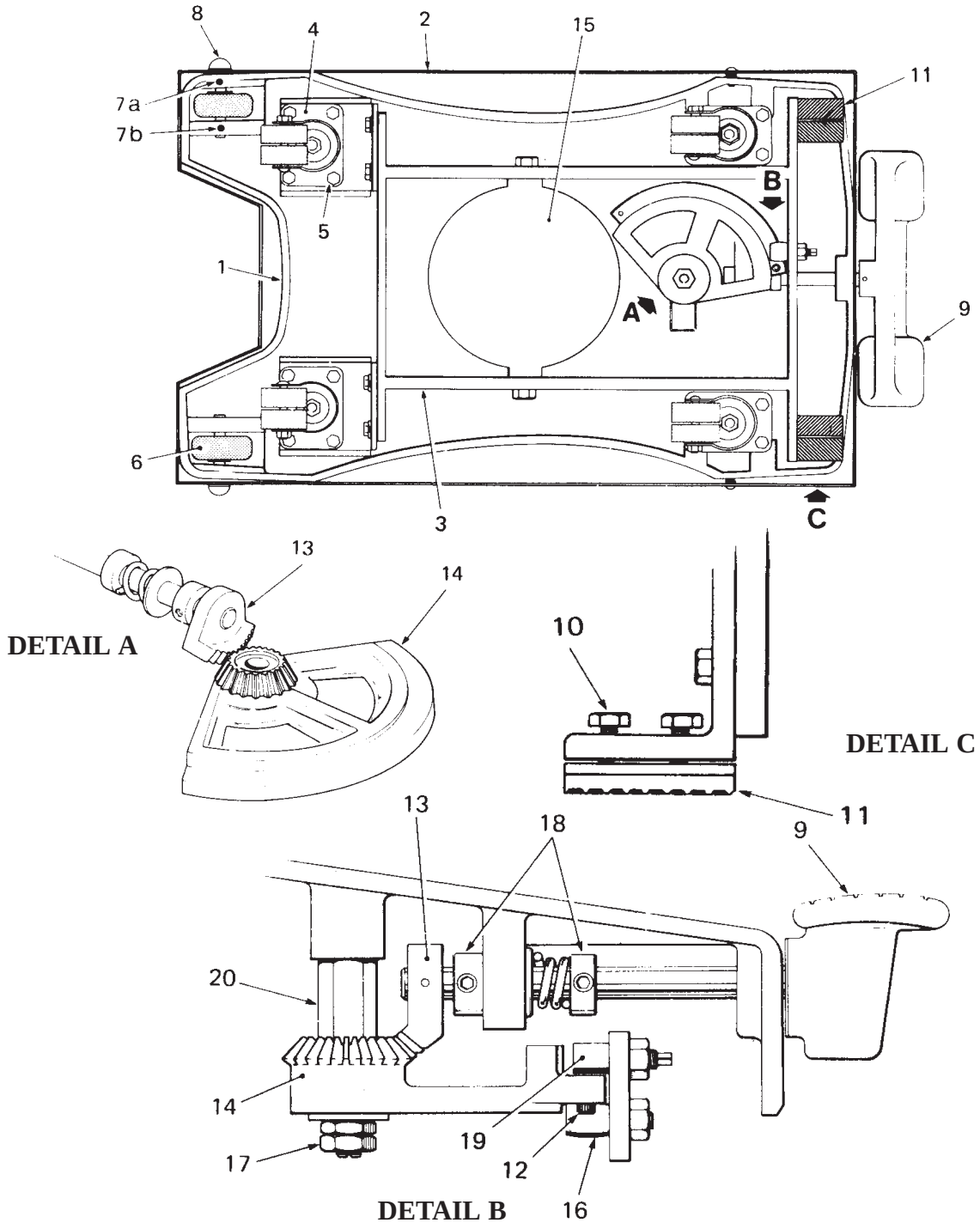
Fig. 4 Ram key adjustment

4.8 Raise the table top to its maximum height again and release the ram cover securing screws at the top. Refer to Fig. 4 and lower the 3-section telescopic cover (1) to expose the ram (2) and ram key (3).

4.9 Remove the ram key, clean out keyway and refit key.

4.10 Examine ram surface for rust and, if present, clean off with fine emery cloth. (Note: Later rams have a black surface coating do not confuse this with rust and attempt to remove it). Lubricate exposed surface of ram. Seal the top of the cylinder with cloth wound round the ram to prevent damage if using emery cloth.

4. MAINTENANCE



1.	Base casting	8.	Wheel spindle	15.	Oil sump
2.	Base cover	9.	Base control pedal	16.	Roller
3.	Castor frame	10.	Brake pad screws	17.	Quadrant securing nuts
4.	Castor	11.	Brake pad	18.	Brake shaft collars
5.	Castor mounting screw	12.	Stop screw	19.	Eccentric pin
6.	Wheel	13.	Pinion	20.	Quadrant pillar
7a/b.	Grub screws	14.	Quadrant		

Fig. 5 Base assembly

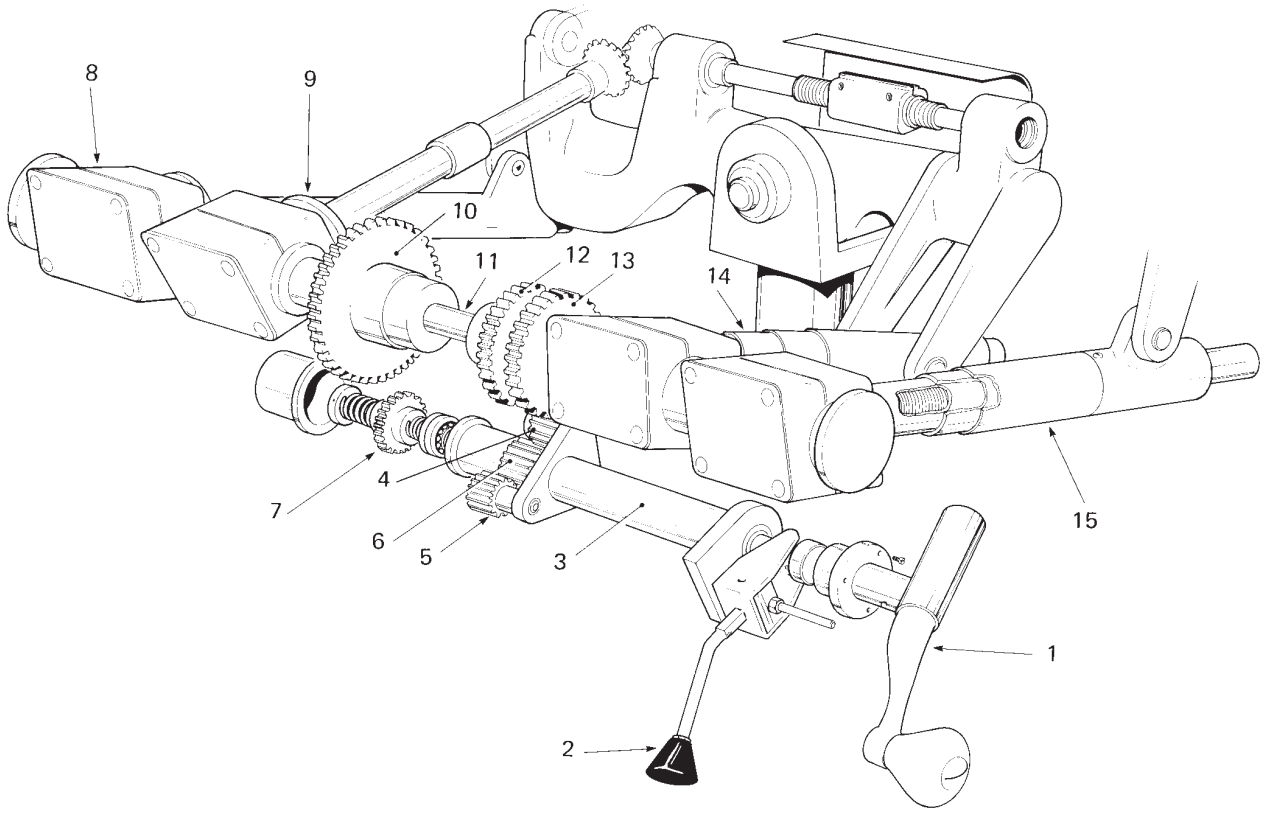
4. MAINTENANCE

4.11 Before refitting ram cover, check that table will raise and lower smoothly. If this is not the case, the ram key is probably secured too tightly. Release the key attachment bolts (4) slightly to remove excessive friction, then retighten.

4.12 Check for signs of oil leaks. If table will not pump to its full height, refill reservoir with the Eschmann oil supplied with the table, in small measures, lowering the table after each addition. This will avoid the risk of introducing too much oil into the hydraulic system.

Gears

4.13 Check function of gear selector lever in conjunction with main control handle and ensure that each table top movement is satisfactorily achieved. Check to see if there is any excessive play in table top in any particular direction (see section 4.14 and 4.15). This applies particularly to the two grub screws (4, Fig. 10) securing screwed bush to screw housing on Trendelenburg and Break screw assemblies. Check friction collar adjustment on Trendelenburg and Break screw gears (see sections 4.16-4.19); also check that



1. Main control handle
2. Gear selector lever
3. Selector shaft
4. Trendelenburg idler gear
5. Break idler gear
6. Gear selector unit
7. Selector gear, lateral tilt
8. Break screw and gearbox (left hand)
9. Pivot gear, lateral tilt
10. Drive gear, lateral tilt
11. Gear shaft
12. Drive gear, break
13. Drive gear, Trendelenburg
14. Trendelenburg screw and gearbox
15. Break screw and gearbox (right hand)

Fig. 6 Gearbox of MR operation table

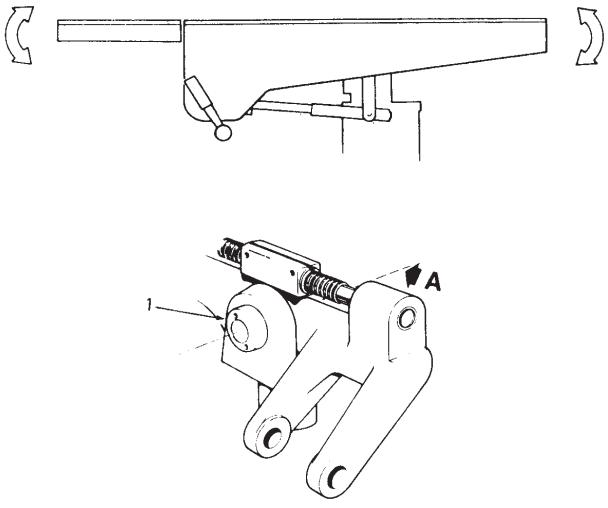
4. MAINTENANCE

gears on the idler plate (Fig. 6) still have clearance and that securing screws are tight on driving and idler gears in main gear train. Check grub screw securing pivot bolt.

Hinge pin and nut

4.14 Pull table top as shown in Fig. 7 to check for excessive play in the direction of the arrows. If there is excessive play present refer to Fig. 7 and check to see if hinge nut (1) and bolt (2) are loose. If so, * tighten hinge nut (1) against hinge bolt (2) sufficiently to take up the slackness. To do this, Eschmann recommend using two short lengths of 3/16 in. diameter round bar (3) inserted in the nut sockets, as illustrated in Fig. 7 and applying an improvised tommy bar (4) to turn the nut.

***Note:** This could also indicate play in Trendelenburg gear. If this is the case the complete Trendelenburg screw assembly must be replaced. For adjustment, see sections 4.16-4.18.



Sectional view in direction 'A'

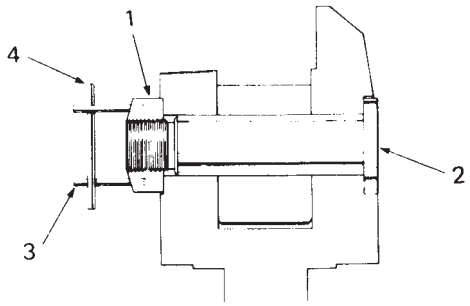


Fig. 7 Hinge pin and nut adjustment

Lateral screw and nut

4.15 Place table top in reverse Trendelenburg position, then select Lateral Tilt and operate control handle to test movement is satisfactory. Pull as shown in Fig. 8. If undue play is suspected refer to Fig.8 and proceed as follows:

i Check secureness of link pivot set screws (6) and (7).

ii Check secureness of grub screw on yoke (5) which locks lateral screw bearing.

CAUTION: Do not over-tighten.

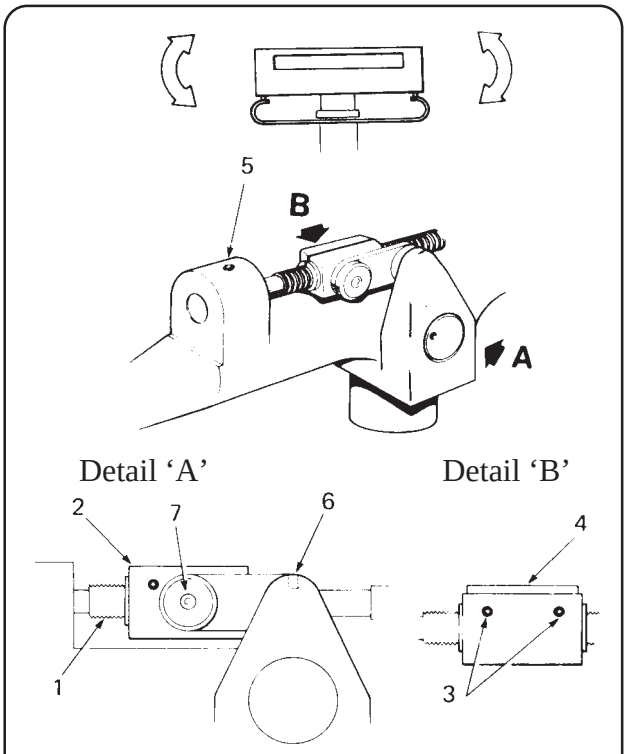


Fig 8 Lateral screw and nut adjustment

iii Finger testing at the point where the lateral screw (1) passes through the nut (2) will establish the need for the nut adjustment. First try tightening socket head screws (3) on nut. If excessive play is still present, shim removal will be necessary. Proceed as follows:

(a) Unfasten socket head screws (3) on nut and extract shim pack (4).

(b) Remove shims (0.002 in thickness per shim, approx.) one at a time until play is *just* taken up on re-tightening.

4. MAINTENANCE

Trendelenburg screw assembly friction collars

NOTE: Sections 4.16 and 4.17 should only be referred to for tables with serial numbers preceding those detailed below, for later tables or tables that have had the latest Trendelenburg screws fitted refer to section 4.18.
Tables with serial numbers as detailed below have the latest Trendelenburg screw fitted and section 4.18 applies :-

MR - 2060 (or above)
MRS - 1177 (or above)

4.16 Adjustment of the friction collars on the Trendelenburg screw **MUST** be checked regularly. If the table does not easily stay in Trendelenburg or reverse Trendelenburg position, but tends to slip down under patient's weight, this indicates that the Tufnol friction collars (9, Fig. 10) need tightening. Proceed as follows:

i Remove the leg section as described in the Instruction Manual and then pump the table top to maximum height with the height adjustment pedal.

ii Elevate the head section to the maximum raised angle and place the table in maximum reverse Trendelenburg position.

iii Remove the gearbox cover (3, Fig. 9).

iv Bolster the table top in position as shown in Fig. 9 and then free the lower end of the Trendelenburg screw assembly (1, Fig. 9) by removing the pivot screws (2, Fig. 9).

v Pivot the Trendelenburg screw assembly about its bevel gear housing (4, Fig. 9) to gain access, in turn, to the four screws (5, Fig. 9) holding the two halves of the housing together. Remove the four screws to separate the two half housings and remove the Trendelenburg screw assembly, with the bevel gear lower half housing from the table.

vi Refer to Fig. 10a. Mark the bevel gear lower half housing (3) and screwed bush (12) to aid reassembly, then remove socket head grub screws (4) from the half housing and unscrew the screwed bush (12) until heads of friction collar grub screws (11) are exposed.

vii Tighten grub screws (11), securing friction collars (9), to a torque of 16 to 17 lbf in.

viii Screw screwed bush (12) into the half housing and secure with socket head grub screws (4).

ix Using a suitable torque wrench (e.g. Torque driver-Part No. 759581 and 4mm Bit-Part No. 759582), attached to nut (17) using adaptor (Part No. 759566), check final friction of screw shaft (15); the torque required to turn screw shaft (15) should be between 30 and 35 lbf in. If final friction torque cannot be achieved, further tighten each friction collar grub screw (11), by 1 to 2 lbf in. per occasion until 30 to 35 lbf in. torque is achieved. If torque figure is not achieved by a maximum setting of 20 lbf in. then refer to section 4.17.

4.17 If further friction cannot be obtained by carrying out the above procedure, the friction collars are worn and a new Trendelenburg screw assembly should be fitted. Refer to section 4.34 under REMOVAL AND INSTALLATION OF COMPONENTS.

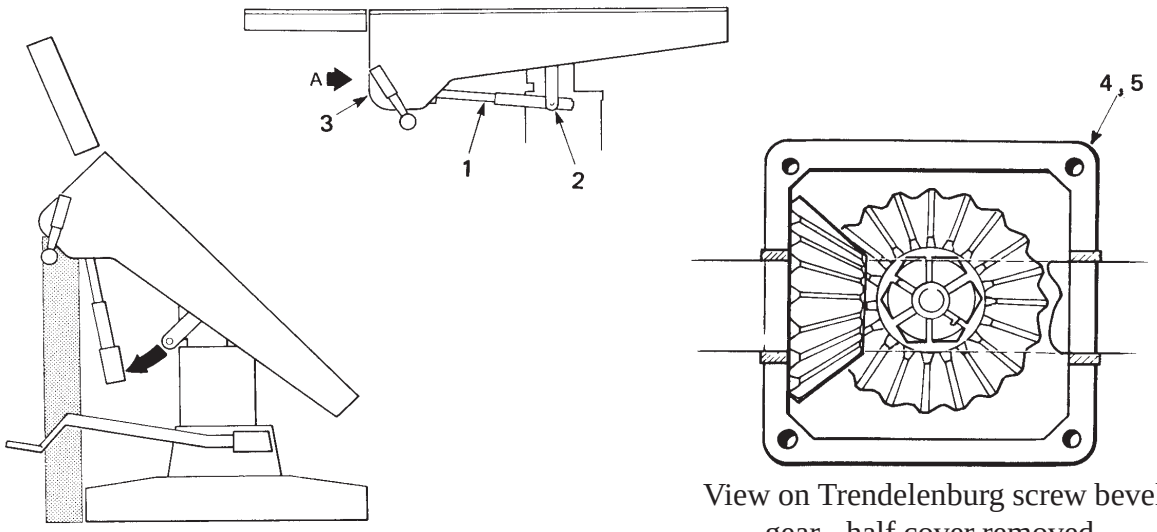
4.18 For tables having the latest design of Trendelenburg screw assembly (see note preceding 4.16) the adjustment of the friction collar on the Trendelenburg screw **MUST** be checked regularly. If the table does not easily stay in Trendelenburg or reverse Trendelenburg position, but tends to slip down under patient's weight, this indicates that the friction collar needs adjusting. Refer to Fig. 10b and proceed as follows:

i Remove the leg flap and place gear lever in Lateral Tilt position.

ii Unscrew sleeve cap (1) and remove the end cap tubes (2) from the Trendelenburg screw assembly.

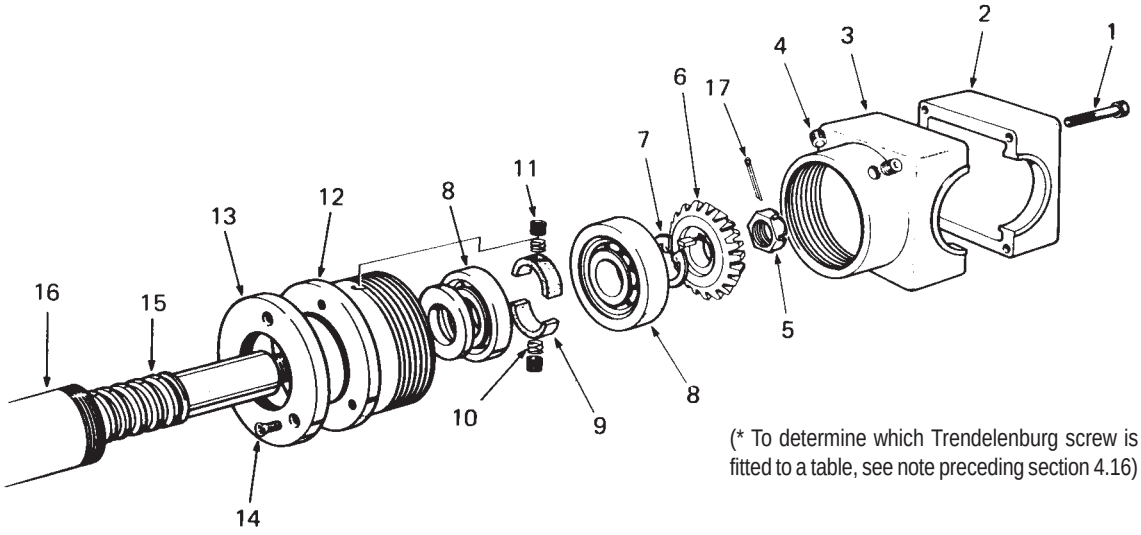
iii Using torque screwdriver (Part No. 759581 set to 20-25 lbf.in. and fitted with adaptor T2095 Part No. 759653 and 20mm socket), check the setting by locating socket over the

4. MAINTENANCE



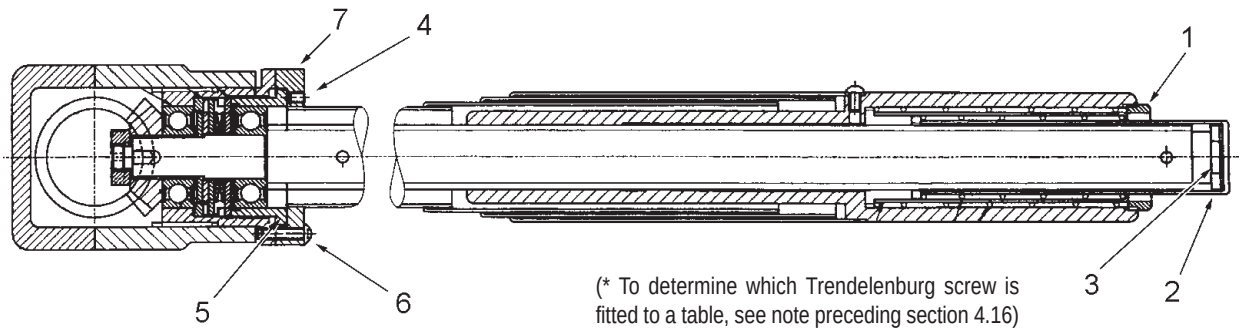
View on Trendelenburg screw bevel gear - half cover removed.

Fig. 9 Releasing Trendelenburg screw assembly



(* To determine which Trendelenburg screw is fitted to a table, see note preceding section 4.16)

Fig. 10a Early* Trendelenburg screw assembly



(* To determine which Trendelenburg screw is fitted to a table, see note preceding section 4.16)

Fig. 10b Later* Trendelenburg screw assembly

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hexagon (3) on the end of the leadscrew and turning the torque screwdriver.

iv If the leadscrew rotates before the torque screwdriver reaches 20-25 lbf.in. the friction collar requires adjusting as (v) below. If the leadscrew does not rotate the friction collar setting is correct and requires no further adjustment and the table can be reassembled.

v Adjust the friction collar by slackening the single grub screw (4) that locks the torque adjuster nut (5) and removing the three screws (6) securing the cap ring (7) located at the rear of the gearbox housing thus exposing the torque adjusting nut (5). Locate spanner (tool number T2097 Part No. 759652) onto the torque adjuster nut (5) and tighten or slacken to gain the correct setting (i.e. the torque setting is between that given in (iii) above but operation of the Trendelenburg handle is not too difficult).

vi Replace the cap ring (7) and secure using the three screws (6), lock the torque adjuster nut (5) by tightening the single grub screw (4) and reassemble the table.

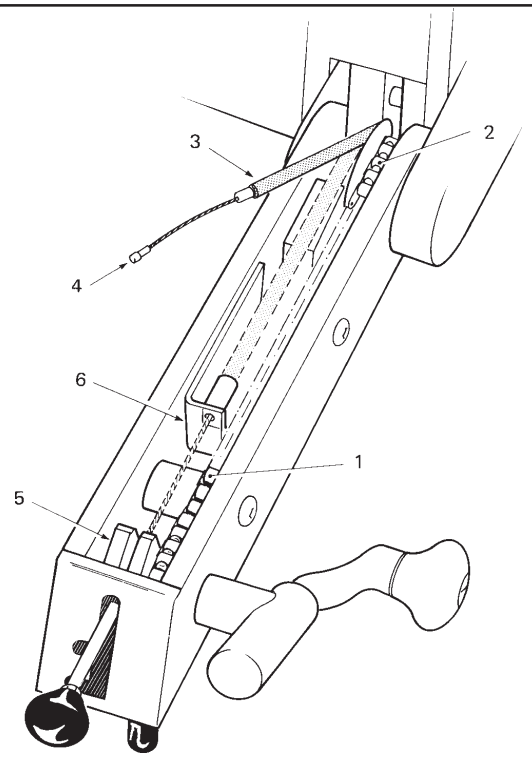

Fig. 11 Control arm (early MRS table)

Chair and Break screw assembly friction collars

4.19 Should the 'Chair and Break' screw friction collars ever require adjustment, the procedure is similar to that for the Trendelenburg screw assembly (see 4.16 to 4.18), once the 'Chair and Break' screw assembly has been released from the gear shaft. (Note that MR tables with serial number 2099 or below have the earlier design of screw detailed in sections 4.16 to 4.18 and tables above 2099 have the latest design screw. All MRS tables have the early design 'Chair and Break' screw).

Control arm (cable type) - MRS only

4.20 The control arm of early tables were cable operated and were fitted to tables with Serial Number 1023 or earlier. Refer to Fig. 11 and remove the control arm cover, then:

i Check chain links (1)

ii Check gears and keys (2)

iii Ensure lubrication of cable (3)

iv Check cable bends and cable nipples (4) (also see Fig. 15).

Control arm (gas spring type) - MRS only

WARNING
Gas springs are filled with high pressure gas.
DO NOT ATTEMPT TO OPEN THEM

CAUTION
Gas springs MUST NOT be additionally lubricated.

4.21 Gas spring operated control arms have been fitted to tables from Serial Number 1024 onwards. Remove the extended head end control arm cover (see Fig. 20) and carry out the following procedures to ensure the correct function of the control arm.

i Check gears and keys and that the chain operates smoothly and is not loose. If the chain is loose it can be adjusted by releasing the three screws located around the main control handle mounting plate. This plate is eccentric and rotating it will alter the chain tension and remove slack, lock the main

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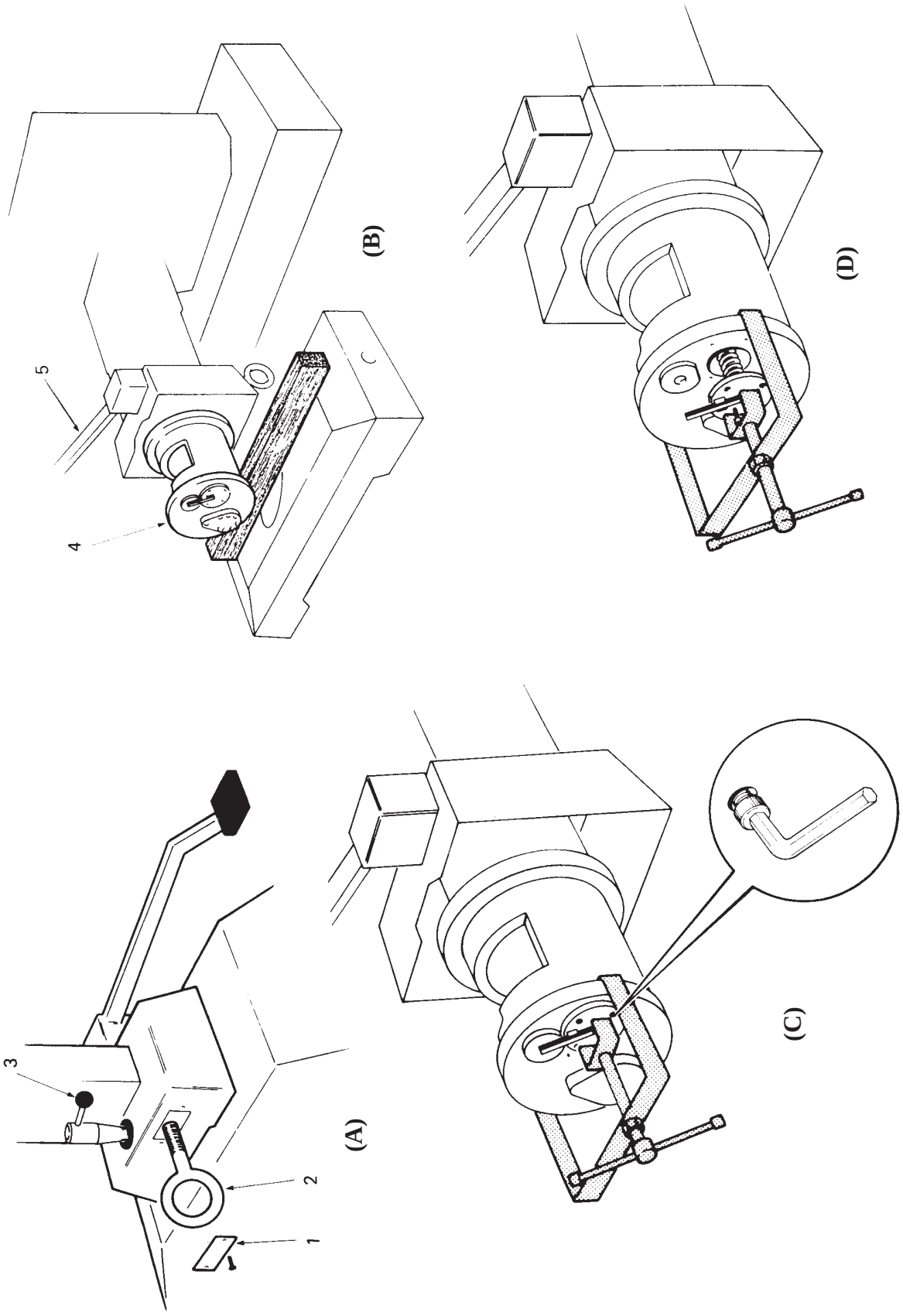

Fig. 12 Removing hydraulic cylinder from table base

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control handle in position with the three screws when adjustment is correct.

ii Check the operation of the gas spring and look for any signs of leakage. Replace the gas spring (see section 4.59) if performance is poor or there are signs of leakage. (Note the Warnings and Cautions regarding gas springs between sections 4.20 and 4.21).

iii Lubricate all moving parts using part number 670010.

iv On completion of routine checks on control arm replace cover and check all functions.

Emergency operation - early MRS table only

4.22 This section only refers to tables with cable operated control arms (i.e. pre Serial Number 1025). Refer to the latest version of the Instructions for Use, Publication No. T-IM18 and place the table in emergency operation. Check that, with the emergency gear lever in the three alternative positions, the table top will move in the corresponding directions by use of the main control handle.

Head/leg section and catches

4.23 Proceed as follows for old style sections without gas spring supports, for sections with gas springs refer to section 4.24.

Note: Gas spring supports were **not** fitted to head sections of tables pre Serial Number 1026 for MRS and pre Serial Number 676 for MR, or leg sections of tables pre Serial Number 1017 for MRS and pre Serial Number 315 for MR. Tables with these Serial Numbers or later have gas spring supports.

i Clean out any collected debris from the recesses of the locking and guide pin push button catches (4, Fig. 17) in the trunk sections of the table. Refer to section 4.49 to 4.52 and dismantle each push button check each component for damage or wear replacing as necessary, Check spring-loaded nylon plungers (2, Fig. 17) for smooth action. Clean and lubricate the catch mechanism then reassemble (again referring to section 4.49 to 4.52.) and test.

ii Lubricate rack and fine adjustment movement of head/leg section.

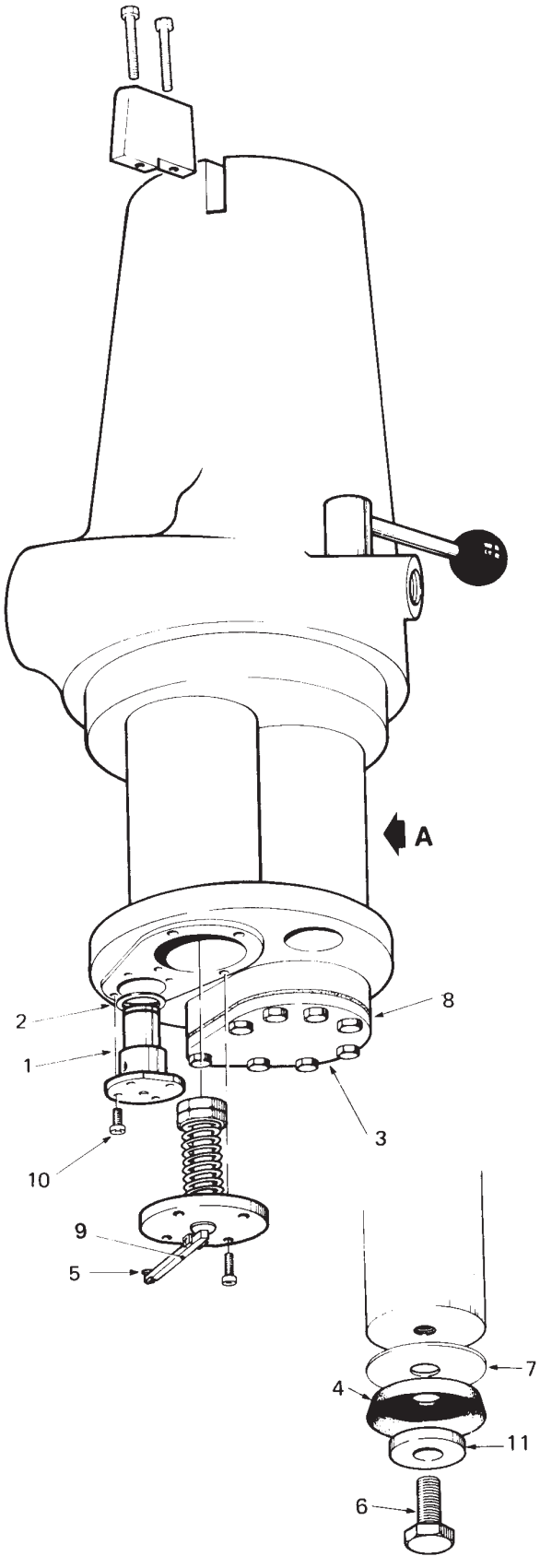

Fig. 13 Hydraulic cylinder assembly

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iii Check tightness of pivot screws and grub screws on head and leg sections.

iv Check tightness of socket headed pivot screws (5, Fig. 18) and cap nuts (4, Fig. 18) on quick release bar (3, Fig. 18) on head and leg sections.

v Check secureness of grub screw on fine adjustment handwheel (1, Fig. 18) on head section only (also see section 4.53).

vi Check clean and lubricate locking pin (7, Fig. 18) and guide pin (8, Fig. 18) with a light machine oil on head and leg sections.

4.24 For tables with head and leg sections incorporating gas spring supports (see note in section 4.23 above for the Serial Numbers of tables that do) refer to Fig. 19 and proceed as follows noting WARNINGS and CAUTIONS preceding section 4.21:

i Check, clean and lubricate guide pin catches as 4.23(i) above.

ii Check clean and lubricate locking pin (23) and guide pin (25) with a light machine oil on head and leg sections

iii Test the action of the release handle and gas spring. If the gas spring support is unsatisfactory (head or leg section fails to maintain its position) the complete gas spring unit must be replaced, they cannot be serviced (see section 4.58). Also seepage of fluid indicates a failing unit that must be replaced.

iv Examine the radiographic top panel for signs of any damage (e.g. cracks or chips) and check that the securing spring collars of the radiographic top are not damaged.

FAULT DIAGNOSIS AND REMEDIES

Excessive rotational movement of table top

4.25 Rotational movement of the table top is controlled by the tapered ram key (3, Fig. 4). Excessive movement is due to wear of the ram key increasing the clearance in the keyway. This can be corrected by slightly loosening the ram key clamping bolts (4, Fig. 4), gently tapping the key into the keyway until excess movement has been removed and retightening the clamping bolts. Check that the ram key has not been over-tightened by fully raising and lowering the table top. If the table top will not raise or lower correctly, the ram key has been over-tightened and must be slackened until normal raising and lowering of the table top can be achieved.

Inability to raise table top

4.26 If normal operation of the height control pedal fails to raise the table with the pedal

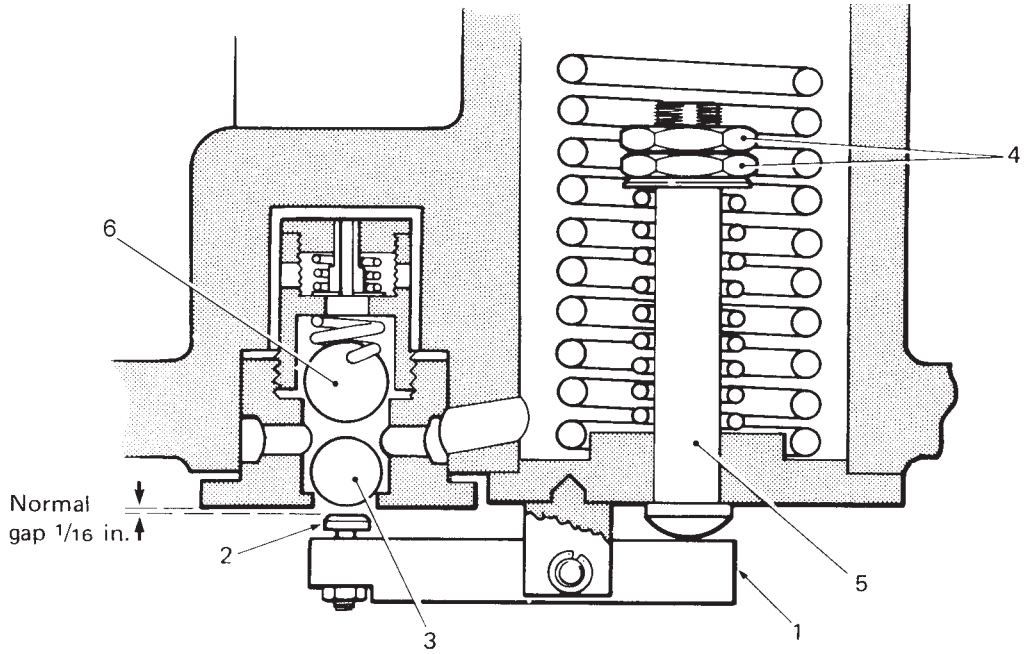

Fig. 14 Ram release mechanism - adjustment

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travelling through its full stroke, the fault is probably due to the presence of dirt in the ball valve, (1, Fig. 13) of the hydraulic cylinder. It is often possible to clear this obstruction by vigorously operating the height control pedal. If this fails, remove hydraulic cylinder from base (see section 4.35); the ball valve should then be disassembled and cleaned (see section 4.37). If the pedal is suddenly inoperable either when raising or lowering the table, refer to section 4.28.

Table top not maintaining height

4.27 If table top fails to maintain height, raise it to its maximum height, fully depress the height control pedal and, by pressing on the table top, force the table top downwards as quickly as possible. Repeat this operation several times. If this does not rectify the fault remove hydraulic cylinder from base (see section 4.35) then examine the hydraulic mechanism for:

i Condition of ball valve jointing washer (2, Fig. 13). If faulty, replace it (see section 4.37).

ii Secureness of ram cover plate (3, Fig. 13). If it is loose, retighten it.

iii Efficiency of ball valve (1, Fig. 13). If blocked or jammed, disassemble and clean it, (see section 4.37). If the seating of the larger (spring-loaded) ball has been damaged, replace the complete valve.

iv Condition of ram cup washer (4, Fig. 13). If worn or chipped, replace it (see section 4.36).

Operation table will not lower

4.28 First examine the steel ram for rust (see note below); a type of black rust not easily noticed can form on the circumference of the ram. This can be identified by rubbing a piece of emery paper on any discoloured portion of the ram surface. If rust is detected, it must be removed completely, as follows:

NOTE: Later tables have a black coating which prevents this rust occurring.

i Protect the top of the cylinder by tying a piece of rag around the ram.

ii Clean the ram surface thoroughly by rubbing hard with emery paper.

iii Carefully clean off all particles of grit and completely cover the exposed ram surface with oil.

iv Test the raising and lowering movement of the table top.

4.29 If on testing the table pump mechanism for normal function it is found to be still inoperable this may be due to the fact that efforts made to lower the table while seized have strained the pump lever driving pin or the ram release mechanism. If the table top descends at all in response to pump lever operation, the descent will be sluggish. To remedy this the following procedure should be carried out:

i Refer to section 4.35 and remove hydraulic cylinder from table base.

ii Examination of the ram release movement must now be carried out. Refer to Fig. 14. When the pump lever is depressed fully, this operates the ram release lever (1). The ram release lever pivots and the release screw (2) enters the ball valve and should lift both balls (3 and 6) at the end of lever travel. Before testing this movement, the pressure in the ball valve should be overcome by forcing the release lever into the ball valve after covering the cylinder with a cloth to avoid leakage of oil under pressure.

iii Now depress the pump lever fully and hold in this position. Test the ram release lever by trying the movement using thumb pressure. If the movement is other than very slight, adjustment is required.

4.30 To adjust ram release mechanism, proceed as follows:

i Position the compression tool clamp (included in the tool kit available for the MR series tables, Part No. 751030) across the base of the cylinder (see Fig. 12c) and lightly tighten it onto the ram release. Use an Allen key to remove the four screws holding the ram release in position.

ii Loosen the clamp until oil starts to run from the hole. Allow the oil to drain.

iii Continue to unscrew the clamp until

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completely loose then remove clamp and ram release (see Fig. 12(d)).

iv Refer again to Fig. 14. Adjustment consists of unscrewing, in a clockwise direction, the two large lock nuts (4) on the end of the release plunger (5) to allow more movement of the ram release lever. This is in order to cause the ball of the ball valve to be lifted further and so release the table ram. (For a more detailed explanation of the hydraulic system, refer to section 4.60 and 4.61).

Note: This adjustment can only be made on a trial and error basis. Each time an adjustment is made the ram release must be refitted into the cylinder and the pump lever tried and held to ascertain whether the release screw on the lever projects too far into the ball valve, or still not enough. Care must be taken to adjust this correctly as strain will occur either side of the normal. As a guide, the normal setting is 1/16in between release screw and ball valve housing (approximately the thickness of an engineer's steel ruler).

v When the correct adjustment has been made, lift the cylinder and table top bodily and guide the cylinder back into the well of the base. DO NOT ALLOW THE CYLINDER TO DROP INTO THE BASE. When the table is in an upright position and before lowering it into the base, refit the locking lever. This will prevent the escape of oil from the cylinder. The table top should now raise and lower normally.

Note: If it is found that the driving pin of the pump pedal has been bent - too badly for any adjustment - a new pump lever must be fitted.

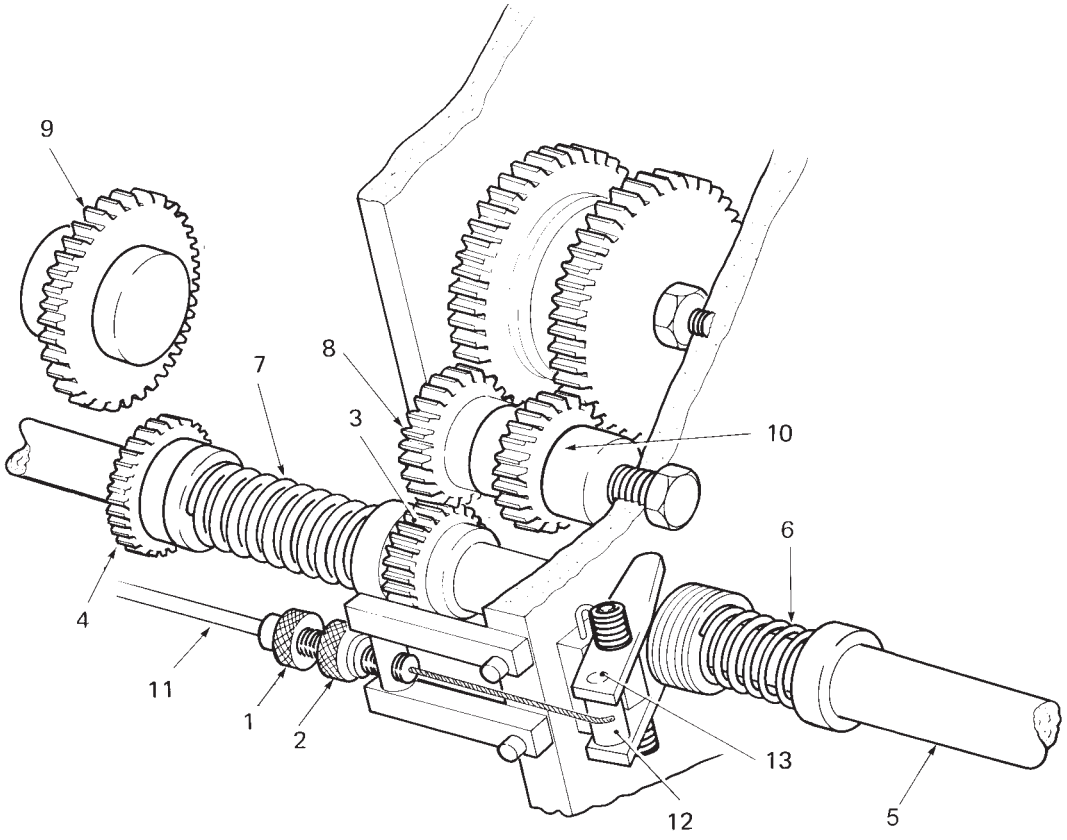

Fig. 15 Control arm cable adjustment/replacement - MRS table pre Serial No. 1024

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Failure of cable operated control arm gear selection, MRS table only (pre Serial No.1024)

4.31. The control arm gear lever operates the table top movement selection mechanism in the gearbox by means of a flexible cable assembly (3, Fig. 11). If movement selection fails to function correctly while the table is in use, immediate action must be taken to engage the standby controls. The fault symptoms can be any of the following:

i The gear selector lever may have been struck and bent, causing gear selection to be upset.

ii Trendelenburg movement is permanently engaged but the gear lever does not spring to this position when placed in the vertical gate. This indicates that the ferrule at either end of the inner cable has been sheared-off, in which case the cable assembly should be renewed or the ferrule resoldered to the inner cable (see section 4.40).

iii Lateral tilt or flexion/extension movement is not engaged when the gear lever is moved into the appropriate position.

iv Trendelenburg and flexion/extension movements are engaged simultaneously when the gear lever is in either of these two positions.

4.32. Symptoms (iii) and (iv) indicate that the inner cable has stretched and the mechanism should be adjusted as follows:

i Select Trendelenburg movement.

ii Refer to Fig. 15 and locate adjusting screw (1) beneath upper trunk section.

iii Slacken thumb nut (2).

iv Check that selector gears (3) and (4) slide freely on the main shaft (5) and that the return springs (6) and (7) function correctly.

v Check that the selector gear (3) is in full mesh with the idler gear (8); if necessary turn the adjusting screw (1) in the direction required to achieve this condition.

vi Select lateral tilt movement.

vii Check that the selector gear (4) is in mesh with the drive gear (9) and that the selector gear (3) is completely disengaged from both idler gears (8) and (10). Small adjustments to the adjusting screw may be made to achieve these conditions.

viii Select chair and break movement.

ix Check that the selector gear (3) is in mesh with the idler gear (10) and that the selector gear (4) is disengaged from the drive gear (9).

x Repeat the checks (5) to (9) with the control arm in two or three different positions, making small adjustments to the adjusting screw if necessary to establish the optimum setting.

xi Tighten the thumb nut.

Control arm not maintaining position (MRS table with gas spring, Serial No. 1024 or later)

4.33 If the control arm will not maintain its position this is normally indicative of a faulty gas spring. Remove the lower control arm cover (as shown in Fig. 20) and check for signs of a damaged or a leaking gas spring, replace if required, see section 4.58. Do not lubricate gas springs and do not attempt to repair them (see WARNINGS and CAUTIONS above section 4.21).

REMOVAL AND INSTALLATION OF COMPONENTS

Replacement of Trendelenburg screw (Fig. 9 and 10)

4.34 To replace the Trendelenburg screw, remove the old Trendelenburg screw assembly from the operation table as detailed in 4.16. Fit a new Trendelenburg screw assembly (latest style see note above 4.16) and adjust it to the correct torque setting as detailed in section 4.18. Reassemble the table.

Note: The bevel gear housing has one thick and one thin side wall. The *thin* side wall should be fitted round the neck of the gear shaft bevel gear. Ensure that the upper bevel gear housing is orientated to match before attempting to refit the cap head screws securing the two halves of the housing together.

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Removing hydraulic cylinder from table base

4.35 Due to the weight of the assembly, three persons will be required for this operation. Proceed as follows:

i Remove the head and leg sections and, if possible, lower the table top to its lowest position.

ii Refer to Fig. 12 and remove plate (1) from cylinder base cover and secure into the exposed tapped hole the lifting eyebolt (2) which is provided in the table tool kit Part No. 751030 (see Illustrated Parts List, T-IPL6).

iii Turn cylinder locking lever (3) fully counter-clockwise and remove it.

iv With one person holding the lifting eyebolt, a second holding the pump pedal and a third steadying the table top, lift the cylinder from the table base.

v When the bottom end of the ram cylinder is lifted clear of the table base, swing the table top and cylinder so that the cylinder (4) is almost horizontal then lay the table top onto a low support, pump pedal (5) uppermost, with the bottom of the cylinder resting on a strong wooden batten placed across the well of the base; this will allow surplus oil to drain into the base.

Replacing ram cup washer

4.36 Remove hydraulic cylinder from table base (see section 4.35), then proceed as follows:

i Refer to Fig. 13 and remove cover plate (3) taking care not to damage the sealing gasket; the ram cup washer will then be exposed.

ii Remove washer retaining screw (6), washer (11), ram cup washer (4) and backing disc (7).

iii Refit the backing disc (7) together with a new cup washer (4) smearing the latter with a little of the oil used for the table hydraulics.

iv Refit the retaining screw and its washer but use only *moderate* tension to tighten the retaining screw; too much and the ram cup washer will tend to buckle and allow peripheral oil seepage - too little and oil will leak past the backing disc.

v Refit cover plate (3) and sealing gasket (8), then manhandle table into base ensuring, before doing so, that the cylinder locking lever (3, Fig. 12) is refitted.

Removing and cleaning ball valve

4.37. Remove hydraulic cylinder from table base (see section 4.35) then proceed as follows:

i Refer to Fig. 13 and remove ram release lever pivot (9) - Sellok pin or screwed pin and lock nut - then remove ram release lever.

ii Unscrew the four ball valve retaining screws (10) and insert two of these screws into tapped holes in valve flange.

iii Continue to turn retaining screws until valve assembly is forced from its seating.

iv Disassemble ball valve assembly and thoroughly clean all components in a suitable solvent.

v Reassemble and refit ball valve, preferably using a new jointing washer (2).

Changing hydraulic oil

4.38 Under normal circumstances it will not be necessary to change the oil in the table base for ten years. After that time change the oil, using 2.8 litres (5.0 Imperial pints) of the Eschmann (Matburn) oil supplied (equivalent to SAE 30 motor oil).

4.39 To change the oil, proceed as follows:

i Lift table top and ram cylinder away from table base, as described in section 4.35 then, after draining off excess oil from cylinder back into table base, remove table top and cylinder assembly and lay it on its side. (Do not stand the assembly on the bottom of the cylinder as this will damage the relief valve mechanism).

ii Invert table base to empty out all the oil and clean out the oil reservoir thoroughly.

iii Reassemble the table into its base.

iv Remove oil filler cap and pour 2.8 litres (5 Imp. pints) of the hydraulic oil supplied into the sump via the oil filler (7, Fig. 3). To do this effectively, the oil should be added little

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by little and the table raised and lowered via the pump pedal after each addition until full table movement can be achieved. This method ensures that excess oil is not introduced.

Removing and replacing control arm cable assembly - MRS table only pre Serial No. 1024

4.40 Proceed as follows:

i Remove table head section in the normal manner as described in the table Instruction for Use.

ii Adjust position of control arm to a convenient working position and remove the socket head screws from the top cover. Lift away top cover.

iii If the ferrule at one end of the inner cable has sheared-off, the inner cable will be loose and the opposite end may be disconnected from its control arm pivot (5, Fig. 11) or cable pivot (12, Fig. 15).

iv Withdraw outer cable from cable holder (6, Fig. 11) and from the adjusting screw (1, Fig. 15. Remove cable assembly from control arm.

v If a new cable is not to be fitted, soft-solder the loose ferrule to the end of the inner cable. Carefully restore the contour of the ferrule (4, Fig. 11)

vi Feed the cable assembly through the control arm.

vii Pass the ferrule (4, Fig. 11) through the cable holder and locate the end of the outer cable in the holder.

viii Pass the ferrule at the opposite end through the adjusting screw (1, Fig. 15) and locate the end of the outer cable in the adjusting screw.

ix Connect the ferrule to the cable pivot (12, Fig. 15).

x Check that the standby gear lever is located in the Trendelenburg position.

xi Move the extended control gear lever to the lateral tilt position.

xii Press the selector lever (13, Fig. 15) to the left.

xiii Connect the ferrule (4, Fig. 11) to the control arm pivot (5, Fig. 11).

xiv Assemble the control arm top cover and tighten the securing screws.

xv Refit the head section.

xvi Adjust the cable assembly (see section 4.32).

Replacing antistatic wheel in table base

4.41 Refer to section 4.3 and tilt table with pump pedal uppermost and wheel to be removed uppermost, then proceed as follows:

i Refer to Fig 5 and withdraw grub screw (7a) just sufficiently to be able to tap out the domed wheel spindle (8) from the inside, while still retaining the bush in position.

ii Slacken grub screw (7b) then fit replacement antistatic wheel with original domed spindle. Adjust position of bush under grub screw (7b) to accommodate width of new wheel, then retighten grub screw (7a) into the dimple of the spindle.

iii Finally, tap the inside bush under grub screw (7b) to make a close fit against the wheel and then tighten grub screw (7b).

Replacing castor

4.42 The castor assembly is available with aluminium or antistatic rubber wheels and comes complete with yoke, wheels, washers, spindle and spindle securing nut. Individual wheels are also available. To replace a damaged castor, refer to section 4.3 and tilt the table with the pump pedal uppermost and the castor to be removed uppermost, then refer to Fig. 5 and remove the four set screws (5) and release the castor mounting plate from the table base. **Note:** When replacing a castor assembly (or just the wheels) ensure that the wheels are identical to the original ones (i.e. polyurethane, antistatic rubber, or aluminium). The wider 'single' aluminium wheels have been discontinued, only the 'narrow double wheels' are available. It may be necessary to fit new castor assemblies and then change the wheels to polyuethane.

Replacing worn brake pad

4.43 Tilt the table to expose the base underside (see section 4.3) then proceed as follows:

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i Note the direction of tread pattern of the worn pad (11, Fig. 5), before removing pad.

ii Remove the two hex screws (10, Fig. 5) securing brake pad to frame and install new pad, with the tread pattern facing in the same direction as that noted in (i) above.

Replacing brake quadrant

4.44 If the base control pedal movement is uneven and jerky the quadrant teeth may be damaged. This can be ascertained by feeling with the fingers under the table base. Tilt the table to expose the base underside (see section 4.3) then proceed as follows:

i Refer to Fig.5 and remove socket head stop screw (12) from beneath cut-out end of quadrant (14).

ii Turn the quadrant clear of the roller (16) remove hex. nuts (17) and withdraw the quadrant. If quadrant teeth are broken, fit new quadrant. For renewal of quadrant pinion, carry out the procedure detailed in the following paragraph.

Replacing quadrant pinion

4.45 Symptoms of jerky movement on base control pedal could also be due to broken quadrant pinion teeth. Verify as section 4.44 for broken quadrant. Tilt the table to expose the base underside (see section 4.3) then proceed as follows:

i Remove quadrant (see section 4.44).

ii Refer to Fig 5 and turn base control pedal (9) until small end of taper pin, securing pinion (13) can be seen.

iii Using a hammer and punch, carefully knock out taper pin.

iv Slacken the grub screws in the two collars (18) on the brake shaft.

v Pull base control pedal and shaft out of table base, allowing quadrant pinion to fall clear.

vi Position new pinion on shaft, lining up the taper pin drillings in the pinion with those on the shaft. Maintaining the tapers in line, ream the pinion drilling relevant to the shaft and loosely fit taper pin. Remove taper pin and pinion from shaft.

vii Locate base control pedal shaft in table base with collars and spring, and secure collars in correct position. Install pinion on end of shaft and fit taper pin.

viii With base control pedal in 'castor' position (see diagram on base instruction plate) install quadrant between roller (16) and eccentric pin (19). Ensure that quadrant and pinion mesh correctly and that the base control pedal is parallel with the base instruction plate in the 'wheel' position, before fitting stop screw (12) to quadrant. Check that brake pads are just clear of the floor in the 'wheel' position.

ix The eccentric pin (19) should be adjusted to take up any excessive play between quadrant and roller.

Replacing broken quadrant pillar

4.46 Proceed as described in section 4.44 to remove quadrant, then remove and replace broken quadrant pillar (20, Fig. 5). Reassemble components.

Replacing main control handle

4.47 For the MR table only, the following procedure must be carried out:

i Place table top in reverse Trendelenburg position and remove gearbox cover.

ii Refer to Fig. 6 to identify gear selector shaft (3). Improvise a suitable distance piece to force the selector shaft outwards against its spring bias. This is to ensure that when the taper pin is removed from the handle shaft the taper pin hole does not disappear inside the gearbox as the selector shaft is drawn in by spring tension.

Now refer to Fig. 16 and proceed as follows for all MR series tables:

iii Punch out taper pin (1) and remove damaged handle (2).

iv Take measurement for drilling new handle, then drill (***one*** side only) a suitable diameter hole to allow use of a tapered reamer.

v Slide new handle onto shaft (3) and align hole through shaft with newly drilled hole in handle.

vi Complete drilling through handle, using a wooden block for the drill to break into - hence protecting the plating on the handle.

vii Use a tapered reamer to shape out the holes for the taper pin. Fit new taper pin (1) ensuring that it is inserted through the aligned holes the correct way round.

viii Remove the distance piece from the selector shaft (see 'ii' above)

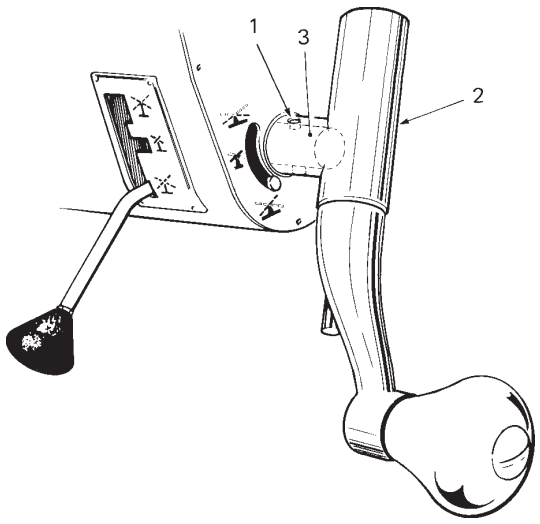

Fig. 16 Replacing a control handle

Replace push-button catches - head / leg section

4.48 Should it be necessary to gain access to the push-button catches for cleaning, lubrication or replacement, first remove the appropriate section (head or leg section) and apply a screwdriver to the slotted end of the threaded spindle of the catch (1, Fig 17). The catch spindles at the lower trunk end of the table are readily visible (at the end of the section underneath the radiographic top) but to gain access to those at the upper trunk end it is necessary to detach the radiographic top of the upper trunk section by removing the socket head screws.

4.49 The *right* hand push-button 'A' catch operates in conjunction with a spring loaded plunger (2, Fig. 17) which, in turn, operates to retain the push-button in the 'release' position if the button is pressed with the head or leg section in position.

4.50 The *left* hand push-button 'B' catch has no retaining plunger and must be pressed in continuously while the head/leg section (or table accessory, where appropriate) is being withdrawn.

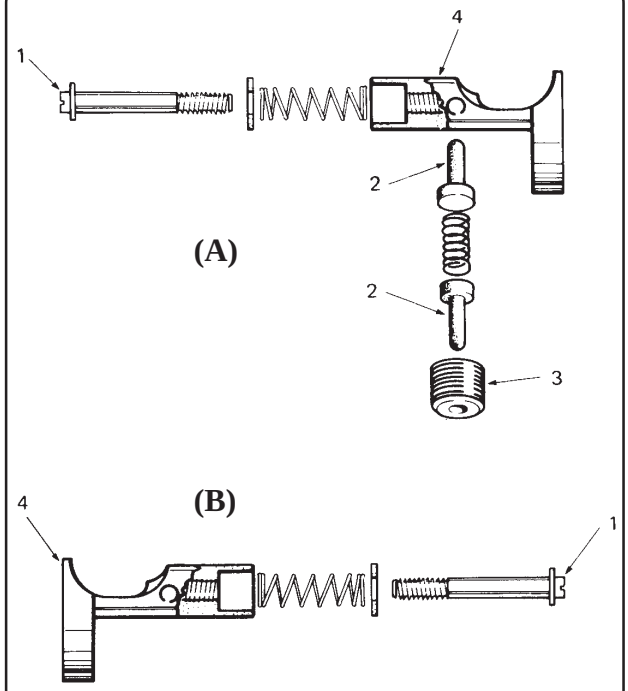

Fig. 17 Catch mechanism for leg section

4.51 Ensure that the spring loaded plunger (2, Fig. 17) referred to in section 4.49 moves freely in its socket. If the plunger has become damaged or distorted such as to impair free movement, it should be replaced. To remove plunger, unscrew threaded bush (3, Fig. 17).

4.52 To remove a faulty latch, unscrew threaded spindle (1, Fig.17) completely and lift away push button/latch assembly (4, Fig.17). If the latch has scored the attachment pins of head/leg section the complete push-button/latch should be replaced. Repair any scoring on attachment pins with a fine file and/or crocus cloth before placing in service again. It is advised that setting tool number T1612 Part No. 759579 is used when finally adjusting push buttons as follows:

i Push setting tool T1612 into guide pin hole up to the edge of the groove.

ii Remove the push button retaining screw from the inside of the arm. Apply screw Loctite and reassemble screw into push button.

iii Tighten the retaining screw until the washer on the inside of the circlip just touches the side of the casting with the setting tool in place.

iv Check the setting of the push button by sliding the tool in and out slowly, it should be possible to feel the push button rubbing on the gauge by resting a finger lightly on the button and a slight jump of the button will be felt when the gauge contacts the button.

Replacing fine control handwheel (on head section pre Serial No. MR 676 and MRS 1026)

4.53. Remove grub screw from handwheel (1, Fig. 18), grip worm shaft (6, Fig. 18) then remove handwheel. When fitting a new handwheel, it is recommended that the grub screw should also be renewed.

Replacing quick release bar on head and leg sections without gas spring units (see Note in 4.23 for Serial Number detail)

4.54. Quick-release bar assembly consists of two rack lift levers (2, Fig. 18) and the release bar (3, Fig. 18). If it is only required to detach release bar, simply remove two domed nuts (4, Fig. 18) at each end of bar to free bar from rack lift levers.

4.55. If complete release bar assembly is to be removed including rack lift levers (2, Fig. 18), unscrew socket head screws (5, Fig 18) on either side and ease lever pivots out of their slots.

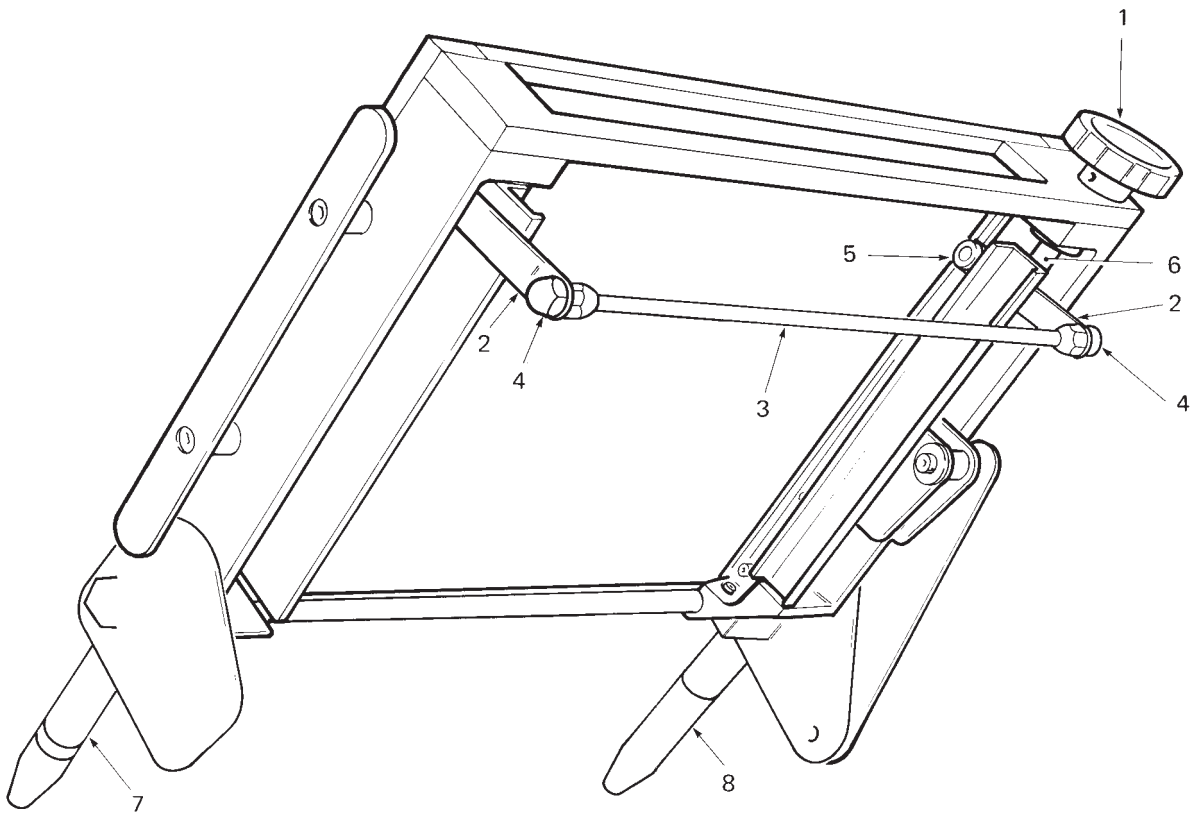

Fig. 18 Head section without gas spring

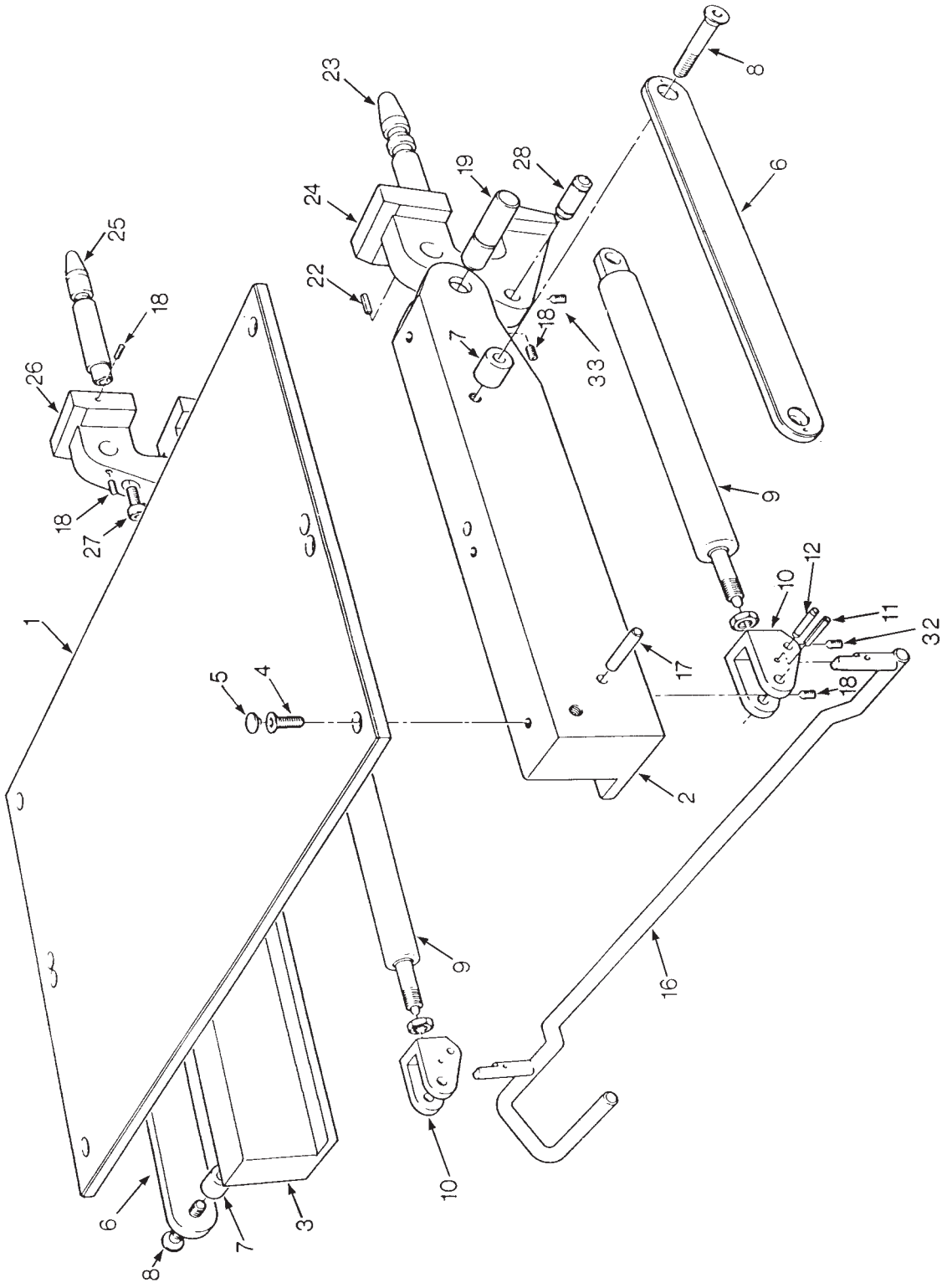

Fig. 19 Head section with gas spring

Replacing release handle for head section with gas spring (see Note in 4.23 for Serial Number detail)

4.56 To replace head section release handle refer to Fig. 19 and proceed as follows:

i Remove both side bars (6) by removing screws (8) together with spacers (7).

ii Release both grub screws (18) and tap out both pivot pins (11).

iii Release both grub screws (32) and tap out both pivot pins (12). Note: on early versions pivot pin (12) was held in place by two circlips (13).

iv Release handle (16) and replace.

v Reassemble by the reverse of above ensuring correct orientation of handle and that the spacers (7) are correctly repositioned, also check correct function and adjustment of gas springs (see section 4.24(iii) and section 4.57(iii)).

Replacing release bar for leg section with gas spring (see Note in 4.23 for Serial Number detail)

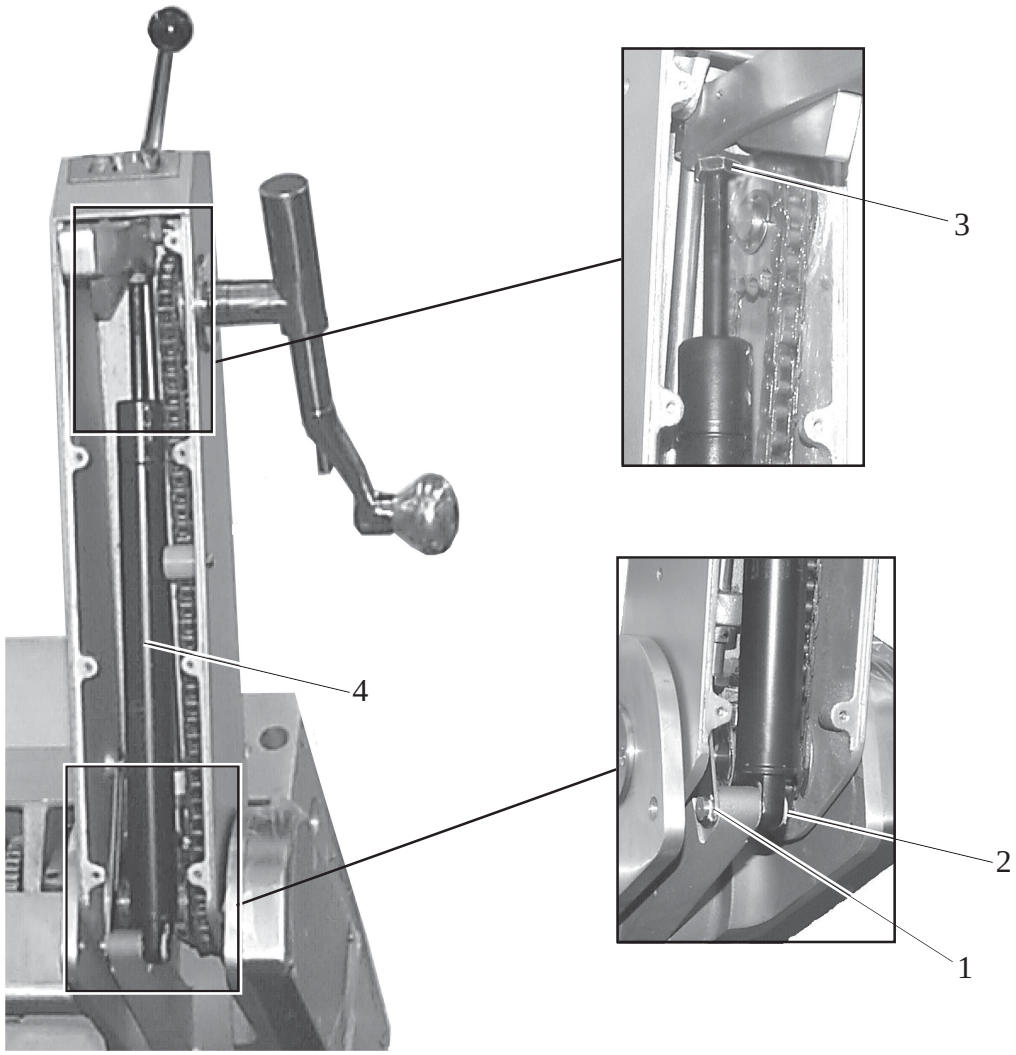

Fig. 20 Control arm with gas spring (bottom cover removed)

4.57 To replace leg section release bar follow the procedure detailed above for the head section handle but replace with a new leg section release bar.

Replacing gas spring unit - head / leg section

Note: See WARNINGS and CAUTIONS above section 4.21 and serial number details in section 4.23.

4.58 To replace a head or leg section gas spring the procedure is basically the same as detailed below for a head section gas spring. Proceed as follows:

i Refer to Fig. 19 and unscrew gas spring nut from link (10) at piston end. Then remove pivot pin circlips (21) and release grub screw (32) if fitted from the hinge block (24 or 26) supporting the cylinder end of gas spring (9).

ii Tap out the pivot pin (28). Remove gas spring unit (9) by unscrewing it from link (10) and replace with a new one, noting warning above and do not lubricate.

iii Fit new unit by reversing the removal procedure and adjust gas spring nut to obtain a 1.0mm gap between gas spring plunger and release handle (or release bar). Refit section on table and check for correct operation.

Control arm gas spring replacement - MRS table Serial Number 1024 or later

4.59 To replace the control arm gas spring proceed as follows but note the WARNING and CAUTION in section 4.21:

i Remove the head end extended control arm bottom cover as shown in Fig. 20.

ii Refer to Fig. 20 and remove the circlip (1) on the pivot pin (2) of the gas spring (4) and loosen the locking nut (3) on the end of the gas springs piston.

CAUTION

The control arm will require support when the pivot pin is removed

iii Remove the pivot pin (2) from the end of the gas spring (3) and unscrew the gas spring piston.

iv Replace the gas spring with a new unit by the reverse of the above.

v Adjust the gas spring by rotating the piston until the release pin just touches the face of the pistol grip release lever. Lock in place with the lock nut and check operation. Finally replace cover and ensure correct operation of control arm.

HYDRAULIC SYSTEM OPERATION NOTES (Fig. 21)

4.60 The following description is to give the user an appreciation of what happens within the hydraulic system during operation of the pump pedal to raise and lower the table top. It should be read in conjunction with section 4.29 and 4.30 when making adjustments to the setting of the ram release mechanism.

4.61 The hydraulic flow sequence, illustrated in Fig. 21 can be followed by referring to diagrams A, B and C.

A. Pump pedal up-stroke. Oil is drawn from sump into piston chamber (3) via the small ball valve (7) which is lifted from its seat.

B. Pump pedal down-stroke (using normal foot pressure). Oil under pressure from piston chamber (3) closes small ball-valve (7) but opens large ball-valve (8) and pilot valve (9), allowing pressurised oil to reach the ram chamber (6).

C. Pump pedal pushed fully down. Piston (2) contacts release plunger (10) to operate ram release lever (11) which opens both small and large ball-valves (7) and (8). Oil from ram chamber (6) then flows at a controlled rate back to the sump via *inner bore* of pilot valve while the pilot valve is seated.

1. Pump pedal
2. Piston
3. Piston chamber
4. Ram
5. Ram cup washer
6. Ram chamber
7. Ball valve (small)
8. Ball valve (large)
9. Pilot valve
10. Release plunger
11. Ram Release lever

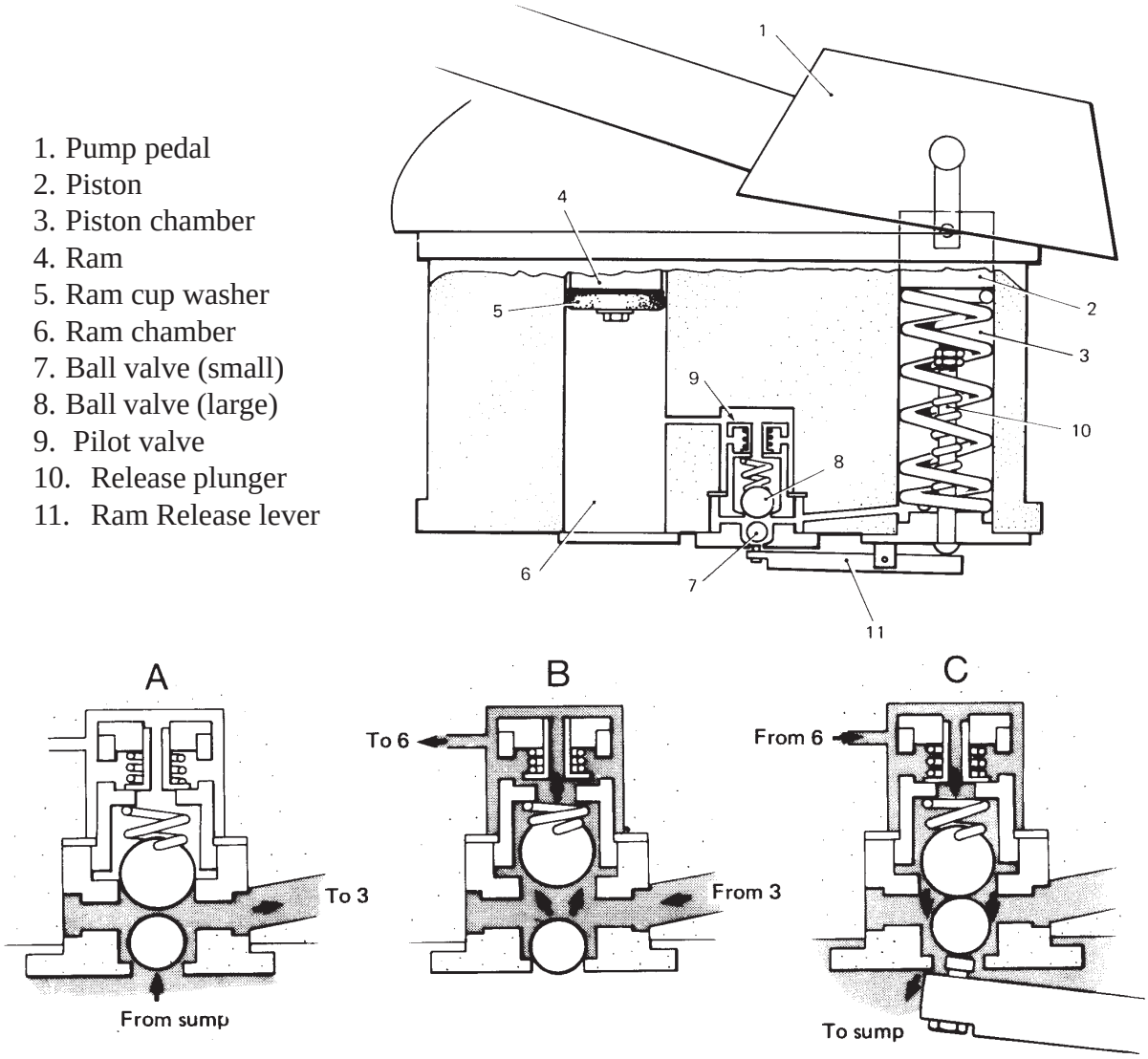

Fig. 21 Hydraulic system operation

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Eschmann Equipment, Peter Road, Lancing, West Sussex, BN15 8TJ, England.
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